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ABSTRACT

This literature review was designed to help educators teach future vocational teachers how to integrate basic skills instruction into their work, and to guide the development of the preservice teacher education curriculum. Selected literature is organized into four chapters. The first chapter clarifies the concepts of "basic skills" and "integration." Chapter two contains information about how the review was conducted, including the sampling design employed by the reviewers and techniques used to collect and reduce the number of references. Procedures used to analyze and summarize the literature are also given. In chapter three, results are organized according to the following topical focus questions: (1) How are basic skills defined? (2) How successfully are those who are about to enter the workforce acquiring basic skills? (3) Why do those who are about to enter the workforce vary in the degrees to which they possess basic skills? (4) How can weaknesses in the basic skills of the workforce be remedied? (5) In what ways can liberal arts and vocational education be integrated? and (6) To what extent does integrating liberal arts and vocational education enhance the acquisition of basic skills? The document closes with a discussion of the competencies necessary for all preservice teachers as they exit the system. (Contains approximately 130 references.) (LL)

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LITERATURE REVIEW

VOCATIONAL TEACHER EDUCATION

ED 376 130

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REVIEW OF LITERATURE

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LITERATURE
REVIEW

VOCATIONAL
TEACHER
EDUCATION

Integrating

Basic Skills into

Vocational Teacher

Education Curricula

REVIEW OF LITERATURE

Funded by:
U.S. Department of Education
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PREFACE

On October 1, 1990, the Office of Vocational and Adult Education of the U.S. Department of Education, under the authority of the Carl D. Perkins Vocational Education Act of 1984 (P.L. 98-524), funded a project to develop and disseminate materials to be used by educators who teach preservice vocational education teachers and guidance counselors. The purpose of the materials was to help these educators teach future vocational teachers and school counselors how to integrate basic skills instruction into their work. A component of this project was the development of two literature reviews — one in vocational teacher education and one in school counselor education — to guide the development of the preservice curricula. This is the literature review addressing vocational teacher education. Readers interested in the literature review addressing school counselor education should refer to Feller, Daly, Gloeckner, Cobb, Stefan, Love, Lamm, and Grant (1992).

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Integrating Basic Skills into Vocational Teacher Education Curricula: Review of Literature

CHAPTER ONE

Introduction

The increasingly technical nature of our society has heightened the need for a skilled workforce effective in using new forms of technology. But success in today's workplace requires more than the ability to adjust rapidly to changing technologies. It also requires the possession of solid academic competencies (Barton & Kirsch, 1990).

As our secondary public school curriculum has evolved in the twentieth century, the task of developing academic competencies in secondary school students has typically rested with those who teach general and college preparatory tracks, and the task of developing the technical skills of secondary school students has rested with those who teach vocational education. A growing body of evidence shows that this bifurcated concept of curricular delivery may not be adequately serving employers (Carnevale, Gainer, & Meltzer, 1988) or students (Selvin, Oakes, Hare, Ramsey, & Schoeff, 1990; Oakes, 1983).

The demands of the workplace have changed dramatically in the last two decades, as have America's students. Yet the concepts and delivery of our secondary school curriculum have changed little to accommodate these new realities. As the United States moves toward the twenty-first century, both academic and vocational education will continue to play a central role in providing workers with skills necessary to succeed in the workplace. Both of these curricular domains must make fundamental changes to address new and dynamic work demands. Given the nature of the most recent amendments to vocational education legislation, it is clear that vocational education is already in the exploratory stages of developing significant structural changes in its delivery systems.

These changes could lead to vocational education programs' drastic diminishment or elimination as a curricular option at the secondary school level. Federal support for these programs might then shift exclusively to postsecondary institutions. Or, vocational education classes could become required as a component of every secondary school student's program. Both of these options could further distance secondary schooling from the local employment sector should vocational instruction come to seem less responsive to the needs of that sector. In addition, there could be severely negative fiscal

consequences to exercising either of these two options, as well as negative social and political effects.

A third option would be to integrate the delivery of academic and vocational curricula such that the best elements of both are taught simultaneously. This approach shows promise as an efficient way to prepare secondary students with the "basics" they need to successfully enter the contemporary workplace. The following review of literature examines this approach.

Conceptual Approach

Introduction

Three issues were addressed to prepare this review. First, the concepts of "basic skills" and "integration" were clarified. Second, procedures were selected to guide the methodological approach to the review. Decisions made in selecting these procedures were: (a) which literature databases should be used and how should appropriate descriptors within those databases be identified, (b) which abstracts should be included in the sampling frame, (c) which sampling procedures should be used, and (d) which processes should be used to organize and summarize the literature. (Chapter Two contains a description of these procedures.) Third, an organizational format was selected. Several were considered: (a) dividing results into theoretical and empirical domains, (b) organizing results around a single unifying theory of vocational and academic integration, and (c) organizing results according to several topical questions relative to basic skills and integration. The reviewers decided to organize results according to topical questions, because this promised to be the most straightforward way to summarize the selected literature. (Chapter Three presents a discussion of these questions.)

Conceptualizing Basic Skills

What are basic skills? Although simple to ask, this question is more difficult to answer. To do so, the reviewers divided the literature into two categories.

Literature Reflecting Societal Concerns

Several "seminal" publications reflect concern about this country's reduced economic competitiveness. Part of the problem, according to these publications, is that our educational system is not aligned with the needs of the American workplace. Examples include the concern that the Russians were winning the at least symbolically lucrative race into space in 1957 when Sputnik was launched, triggering the emphasis on science education in the

1960s. More recently, anxiety over America's decreasing global competitiveness and the perceived inferior academic preparation of our youth relative to youth in other industrialized countries helped support the educational reform movement of the 1980s.

Such societal concerns have resulted in highly publicized documents, often by "blue ribbon panels" or "special commissions," stressing deficiencies of American youth and the educational system. Examples are the National Education Association (1894), Bruner (1963), Carnevale et al. (1988), and the Secretary's Commission on Achieving Necessary Skills [SCANS], U.S. Department of Labor, (1991). These documents usually list "basic skills" as missing from the core secondary curriculum. It seems that defining "basic skills" or outcomes of education is not a recent problem, nor is it likely to vanish at the turn of the century.

Literature Reflecting Theories and Philosophies of Knowledge and Learning

This literature set includes, for example, the work of Gardner (1983; 1987), who postulates that there are seven different forms of intelligence. Similarly, Caine and Caine (1991) theorize that teaching and learning should be oriented around how the brain functions. If these theories are true, each should presumably be grounded in a foundation of "basic skills."

Another theory promoted the idea of knowledge categories. Maccia (1965) proposed four categories of information used to organize and develop knowledge: (a) descriptive, for knowledge of physical, biological, and social sciences; (b) prescriptive, for knowledge of the fine arts and humanities; (c) praxeological, for knowledge of practice or doing; and (d) formal, for knowledge of logical systems (e.g., mathematics or language). One could, at least hypothetically, identify a set of basic skills fundamental to each of these.

The reviewers also found research presenting philosophical positions on knowledge and the purposes and outcomes of schooling. These could have been used to develop a rationale for defining essential or basic skills. An example: the National Education Association's Commission on Reorganization of Secondary Education (1918) report, "Cardinal Principles of Secondary Education," presented principles believed to lead to social efficiency. The seven principles were: (a) health, (b) reading, writing, mathematics, and communication; (c) family; (d) occupation; (e) citizenship; (f) leisure and recreation; and (g) ethics and morality. Presumably, there would be a set of basic skills associated with each of these.

Conceptualizing Basic Skills: Summary

Contemporary definitions of basic skills stem from social conditions, economic factors, political pressures, and/or curricular goals, in conjunction with the value system of those developing the list of skills. Consequently, any

list of basic skills in a review of literature such as this one should present the context in which the list was derived.

This literature review was written to help develop a curriculum to be taught to preservice vocational education teachers. Therefore, it had to take into account vocational education's link to a bifurcated public school curriculum of liberal arts education and vocational education. A common core of basic skills can be taught in both of these systems, but many of the skills perceived to be basic for each can only be taught through involvement in each system. To be successful in the changing workplace, employees must possess skills which help them continue to learn, and skills which help them balance the pressures of family and work. The goal of this review was to include literature addressing basic skills needed to succeed in all these areas. To meet this goal, the reviewers have included literature reflecting both (a) philosophies and theories of knowledge and learning and (b) societal concerns.

Conceptualizing Integration (See Figure 1)

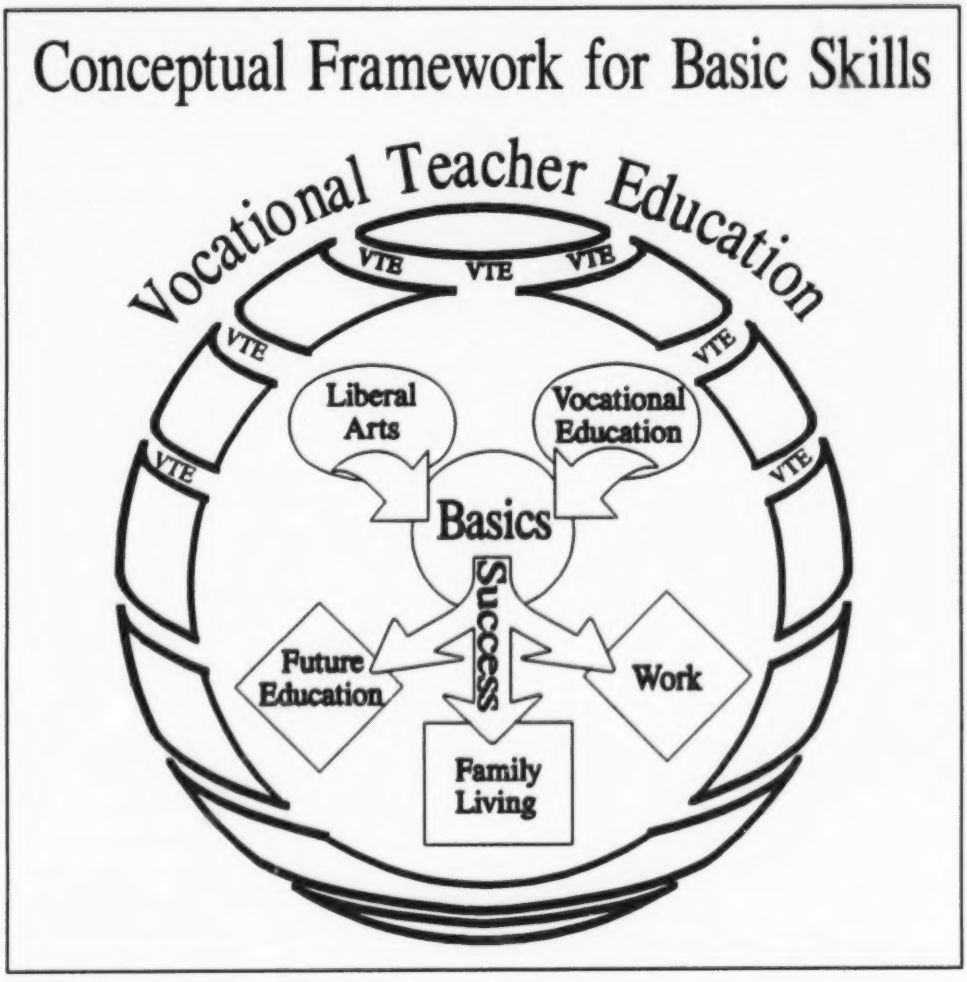
What is integration? The reviewers assumed that integration is one or more strategies allowing the combination of curriculum and/or instruction across multiple disciplines.

Integration has been viewed in three ways: (a) integration of programs or curricular content, (b) integration of facilities or physical environments, and (c) integration of personnel. It should be noted that in each of these, integration can occur by one of three means: (a) vocational education into liberal arts education (unidirectional), (b) liberal arts education into vocational education (unidirectional), or (c) liberal arts education and vocational education integrated simultaneously into each others' delivery systems (bidirectional).

Curricular Integration

The literature documents multiple approaches to integrating curricula (Plihal, Johnson, Bentley, Morgaine, & Liang, 1990; Fogerty, 1991; Drake, 1991). One approach, for example, is to fuse curriculum of two or more subjects, combining them into a new subject — for example, business and algebra to form business algebra. Another approach, a multidisciplinary one, is to focus on a single theme across a variety of disciplines. An example would be the design and building of a spacecraft, in which physics, music, home economics, and technology education curricula all incorporate lessons leading to the completion of the experience. The primary feature of curricular integration is that the curriculum content across two or more disciplines is integrated toward a common goal or theme.

Figure 1


Conceptual Framework for Basic Skills
Vocational Teacher Education
VTE
VTE
VTE
VTE
VTE
VTE
VTE
Liberal Arts
Vocational Education
Basics
Success
Future Education
Work
Family Living

Facility or Environmental Integration

Facility or environmental integration involves changes in building(s) or laboratory setting(s) such that two or more disciplines are taught together. For example, science and technology might both be delivered in an academy school. On a lesser scale, a vocational automotive teacher might use the physics laboratory for a series of lessons focusing on the resistance associated with braking an automobile.

Integration Through Personnel

Personnel exchanges may be used in integration. For example, a mathematics teacher may visit an automotive vocational class for two hours a week to teach the relevant mathematics. A second example: A business teacher and an English teacher may team teach a business communications course. Many of the newer content areas such as biotechnology, principles of technology, and applied communications often require the expertise of more than one teacher. Integration through personnel exchanges can work without fusing the two teachers' curricula or making physical changes to the classroom.

Each of these three ways of achieving integration is conceptually discrete, but two or even all three of them can be used together.

Methodological Approaches

The Nature of the Literature

Chapter Two contains information about how this literature review was conducted. Preliminary screening of the relevant literature to define its parameters suggested that the bulk was theoretically based. This theoretically based literature included position statements, discussions of perceived needs and proposed solutions, philosophical views or arguments, and non-empirical descriptions of current projects. These publications were typically "best guesses" to problems and solutions related to basic skills and integration, and did not include original data supporting those positions.

Regrettably, only a handful of empirically based manuscripts appeared in the preliminary screening of the literature, and these were largely descriptive surveys. Experimental studies were extremely few in number. This preliminary information about the nature of the literature on basic skills and integration affected the review process. These effects are explained in the introduction to Chapter Two.

Organizational Format

After considering a variety of formats for this review (e.g., Cooper, 1984; Slavin, 1986), it was decided to use a four chapter format, analogous to a report of primary research. This first chapter contains an introduction to the literature review itself, and concludes with a presentation of the problem statements, focus questions, and technical information that guided the review process. Chapter Two contains methodological information on the mechanics of the review: the sampling frame of theoretical and empirical literature, the literature databases, descriptors, etc. Chapter Three presents the results of the review, and is organized around six focus questions. Chapter Four summarizes the results and includes recommendations relating to issues associated with curriculum, instruction, and policy. Concrete suggestions for preservice curriculum development in vocational teacher education are also given.

Problem Statements

Two problem statements informed this review.

1. What are the basic skills which lead to success in education, work, and family, and how can these skills best be taught?
2. What are techniques for integrating liberal arts and vocational education, and what are the implications of using these techniques to help students acquire basic skills?

Focus Questions

To address these problem statements, six focus questions were developed. Data collected through the review process are organized around these questions.

1. How are basic skills defined?
2. How successfully are those who are about to enter the workforce acquiring basic skills?
3. Why do those who are about to enter the workforce vary in the degrees to which they possess basic skills?
4. How can weaknesses in the basic skills of the workforce be remedied?
5. In what ways can liberal arts and vocational education be integrated?
6. To what extent does integrating liberal arts and vocational education enhance the acquisition of basic skills?

Limitations

The reviewers confronted several methodological limitations. First, they were hampered by a lack of published information on how to "review" non-empirical literature. A variety of texts were consulted. Most of these texts focused on social research methods (c.f. Kerlinger, 1973; Simon, 1978), research design (c.f. Cook & Campbell, 1979; Kennedy & Bush, 1985; Ary, Jacobs, & Razavieh, 1990; Wiersma, 1991), and research proposal development (c.f. Locke, Spirduso, & Silverman, 1987; Krathwohl, 1988; Long, Convey, & Chwalek, 1985; Balian, 1982). The chapters in these texts dedicated to the literature review process were minimally developed and solely concerned with how to use electronic literature databases and abstract material from acquired literature. None gave guidelines for synthesizing the abstracted information.

A smaller number of texts were devoted exclusively to synthesizing research results (Cooper, 1984; Glass, McGaw & Smith, 1981; Hunter, Schmidt, & Jackson, 1982; Light & Pillemer, 1984). These texts focused on how to synthesize quantitative data from empirical research, with brief attention to qualitative data syntheses (see Light & Pillemer, pp. 104-143; Noblit, 1991). Again, however, no attention was given to synthesizing non-empirical literature.

This review was also limited by two other factors: The number of accessible literature databases was small, and the definitions of descriptors varied from one database to the next. As an example, in the Medline database, "integration" was not a key word, yet there may have been studies that explored topics related to integration as defined by this review.

Finally, this review was constrained by a predetermined limitation of staff and time to use in compiling it, dictated by the terms of the contractual arrangement mentioned in the Preface.

Delimitations

Data collection for this review was restricted primarily to electronic database searches. These searches identified relevant literature from both published and unpublished sources. Literature more than a year or two old and not in an electronic database may have been systematically excluded. However, a number of primary sources, as defined by Cooper (1984), were included even if not part of an electronic database. As an example, the SCANS Report (1991), did not appear in the electronic searches but was included because it was germane to this review.

Of the documents identified through electronic search procedures, only those with publication dates of 1985 or later were selected. Because of this delimitation, only the most current theories and research on the topics of integration and basic skills are reflected in the literature review. References

published prior to 1985 were used as background information to help, for example, in selecting the theoretical framework of and procedures for the review. However, they are not reflected in its discussion.

Assumptions

It was assumed that the electronic databases contained a representative sample of both theoretical and empirical literature on the concepts of integration and basic skills. It was also assumed that the key words used in the electronic databases represented the concepts sought.

CHAPTER TWO

This chapter describes the sampling design employed by the reviewers. It also explains the techniques used to collect the literature and reduce the number of references from a large, general set to a smaller set relevant to this review. Procedures used to analyze and summarize the literature are also given.

Sampling Design

This literature review comprises published and unpublished writings that contain information on the subject of basic skills and integration as they are defined in the previous chapter. The sampling frame or accessible population of literature was derived from searching electronic databases and other purposefully selected primary sources of professional writings. Not all available electronic databases were searched. Judgment was used to determine which databases would be likely to contain substantive sources with theoretical or empirical findings regarding the integration of basic skills into academic and vocational education. Thus the following databases were searched:

Academic Index, American Business and Industry, Arts and Humanities Search, A-V On Line, British Education Index, Chemistry Industry Notes, Child Abuse and Neglect, Computer Database, Conference Papers Index, Current Contents Search, Dissertations Abstract International, Economic Literature Index, Educational Resource Information Citations, Exceptional Children Educational Resources, Family Resources, Information Science Abstracts, Language Abstracts, Medline, Microcomputer Index, Nursing and Allied Health, Psychlit, and *Social Science Search.*

The descriptors used to identify sources from the various databases were: *academic skills, applied academics, basic skills, communications, employability skills, home economics, integration, mathematics, science, secondary or postsecondary education,* and *vocational education.* These descriptors formed the primary set of items directing the search. Boolean logic was used, combining descriptors with "AND", "OR," and "NOT" statements to sort through documents in databases. This logic was then used to combine most of the terms with "OR" statements and then to impose the limitations of *secondary education, postsecondary education,* and *vocational education* with "AND" statements.

With most literature databases, more than one search was used. The "germaneness" (Slavin, 1984; 1986) or "concepts to operations congruence" (Cooper, 1984) of the output from each preliminary search dictated the extent to which successive iterations with that database were conducted. For example, in many databases, the term "integration" yielded articles relating to

the impact of different techniques of busing as a means of enhancing racial integration. Thus, these were eliminated from the review, and other descriptors entered in the search to produce a more germane literature set.

Even with these multiple eliminative iterations, the electronic database searches produced 442 citations of documents deemed to be directly pertinent to this review. Abstracts of these documents were then reviewed, and the entire dataset of abstracts was then partitioned into two major subsets of literature: theoretically based literature and empirically based literature. Over 90% of the 442 citations were theoretically based.

Next, a preliminary review of 30 randomly selected theoretically based manuscripts was conducted to explore their content and look for patterns of information. This review revealed substantial redundancies in the material. Hence, it was decided to use a systematic sample of 25% of these theoretically based documents (every fourth one), to which were added all empirically based documents (approximately 30-40) and additional primary sources not generated through electronic searches. This yielded a final sample of approximately 200 documents which made up the literature sample. Attempts were then made to locate hard copies of all of these documents. Ninety hardcopy documents were read and are reported in this review.

The written format of this review is generally consistent with guidelines in the Publication Manual of the American Psychological Association, Third Edition, (1983).

CHAPTER THREE

Problem Statements

Two problem statements informed this review.

1. What are the basic skills which lead to success in education, work, and family, and how can these skills best be taught?
2. What are techniques for integrating liberal arts and vocational education, and what are the implications of using these techniques to help students acquire basic skills?

Focus Questions

To address these problem statements, six focus questions were developed. Data presented in this chapter are organized around these questions.

1. How are basic skills defined?
2. How successfully are those who are about to enter the workforce acquiring basic skills?
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4. How can weaknesses in the basic skills of the workforce be remedied?
5. In what ways can liberal arts and vocational education be integrated?
6. To what extent does integrating liberal arts and vocational education enhance the acquisition of basic skills?

Focus Question One

"How are basic skills defined?" To address this question, literature was reviewed that describes the range of ideas circumscribing "basic skills." A categorization scheme was developed to organize this range of ideas.

The Range of "Basic Skills"

The term "basic skills" has different meanings for different people (Dunn, 1988). It often has political currency (Miguel, 1985), with employers utilizing the term loosely to mean a degree of work readiness and a variety of work related sets of skills. Basic skills are often defined as skills once referred to as the academic skills of reading, writing, and arithmetic (Dunn, 1988; Applying the Academics, 1989; Miguel, 1985; Owens, 1988; Strumpf,

1986; Pritz, 1988; Lee, 1988). In addition to this academic definition, basic skills are now also cited as social competencies, such as the ability to balance a checkbook or read safety instructions (Dunn, 1988). The term is also used to define attitudes found in successful workers, such as being dependable and responsible, coming to work on time, and being able to get along well with co-workers (Semple, 1987).

In a project sponsored by the Office of Educational Research and Improvement (Natriello, 1989, pp. 2-6), 14 studies focusing on the "needs of employers" were reported. Findings related to basic skills are shown in Table 1.

Table 1

Author/ Year/ Population	Findings
Baxter & Young (1982), 96 Mississippi employers	Study #1—Attitudes related to working in association with others were rated most useful and as requiring the most emphasis in high school. Basic skills identified included: dependability, basic communication, thinking and problem-solving, and basic arithmetic. Study #2—Poor communication skills and low interest were identified as reasons for rejecting job applicants.
Chatham (1983), 8 San Francisco companies	Characteristics that affected employee selection or performance included: communication skills, appearance, stable work experience, self-confidence, interviewing skills, desire to learn, accurate application, and grammar.
Chung (1979), 105 firms in Connecticut	Entry level workers were rated as generally deficient in the basic skills of mathematics, reading, and writing. Entry level workers also frequently lacked career goals and enthusiasm for the job.
Committee for Economic Development (1984), 678 large firms, 626 small firms, and 500 postsecondary institutions	Positive work attitudes and generic cognitive skills were rated as more important than job specific skills for entry level workers by both large and small businesses. Ability to learn and thinking skills were rated as most important for advancement.

Author/ Year/ Population	Findings
Crain (1984), 1,912 employers	Dependability, proper attitude, being a good team member, and basic adult literacy were all rated as extremely important.
Gordon (1985)	Attitude and grammar were the two critical factors for successful interviews.
Gustafson & Groves (1977), 23 employers in New Hampshire	Trustworthiness, flexibility, appearance, respectfulness, and cooperativeness were rated as the top work attitudes.
Hulsart & Bauman (1983), 135 managers, 130 entry level employees, 45 military and 8 civilian instructors, and 57 young recruits in Colorado	Employers were interested in individuals who accepted responsibility, had an interest in serving a client, could work cooperatively with others, could handle money, and were dependable and punctual.
Illinois State Advisory Council on Adult, Vocational and Technical Education (1983), 100 employers and educators	Educators and especially employers stressed the need for youth to develop proper attitudes about work and realistic expectations about job content and wages, along with basic skills. They noted that they are finding an increasing number of young people who are from homes that never had anyone get up and go to work in the morning.
Junge, Daniels & Kantor (1983), 51 personnel administrators of the largest companies in the state of Illinois	Employers ranked the skills of communication and reasoning especially high. "Writing standard English sentences" was cited as the most serious deficiency.
Moon (1983), 50 companies in 16 states	Nearly every company noted the need to upgrade basic skills, especially language skills, basic math skills, and oral and written communication skills.

Author/ Year/ Population	Findings
Owens and Monethey (1983), 780 employers in stratified random sample in Oregon	Employers noted problems in three stratified general areas: basic skills, work attitudes, and understanding of the business environment. Problem solving skills were often cited as deficient. While employers noted that students who had received training in specific job skills were generally proficient, they noted that employees had difficulty generalizing those skills. Employers felt the school should be responsible for basic skills and employers should be responsible for specific technical skills. Over half of the respondents noted a lack of acceptable work values; 30% noted a lack of job skills and knowledge.
Wilms (1983), chief employment and training officers at 172 Los Angeles and Torrance, California, companies	Most respondents (63%) reported that good work habits and positive attitudes were most important for success in the job. Substantially fewer respondents (23%) cited technical skills as most important, and fewer still (14%) cited linguistic and computational skills as most important. Employers also reported that technological changes have had little impact on skill requirements for entry level jobs.

A study conducted as part of a project from the Office of Vocational and Adult Education (Hull & Sechler, 1987) examined the nature and extent of adult literacy needs in the American labor force. Data for the study were collected from a review of literature, site visitations, and consultations with a panel of technical experts. Basic skills which were seen as being essential to successful job entry or to entry level performance were as follows: (a) reading, writing, and counting; (b) adding, subtracting, multiplying, and dividing numbers; (c) following written instructions; (d) writing legibly; (e) completing forms and applications adequately; (f) signing forms appropriately; (g) writing dates and times correctly; (h) knowing the letters of the alphabet; (i) discriminating among visual words; (j) using listening skills to identify procedures to follow; (k) using listening skills attentively; (l) applying information learned through listening; and (m) speaking face-to-face coherently (p. 27).

A four year study examined the variety of school and employer practices used to help youth prepare for employment (Bishop, 1985). Data were compiled by contacting nearly 5,000 employers across the United States. The study identified the following basic skills: (a) communication skills -- reading, writing, speaking, and listening; (b) mathematical skills; (c) knowledge and understanding of science and technology; (d) reasoning and problem solving; (e) good study habits; and (f) motivation. The study included a set of recommendations for developing policy at the local level to improve students' preparation in these basic skills.

A study conducted by Knold (1986) assessed the attitudes of 702 Washington State employers toward vocational education at the secondary and postsecondary levels. Over 90% of respondents indicated that a strong background in basic skills was essential for those graduating from vocational education programs. The most important competencies for high school and postsecondary vocational school graduates were positive work habits and attitudes. The employers believed that subject areas needing increased emphasis included mathematics and English. The report concluded that the integration of basic and employability skills should be an essential part of vocational education, and that a strong core curriculum of English, mathematics, and science was needed for all secondary students.

Categorizing Basic Skills

It is clear that researchers, educators, and employers define "basic skills" in many ways. These varied definitions make it challenging to differentiate basic skills and place them in specific categories. An extensive study by the United States Department of Labor and the American Society of Training and Development (Carnevale et al., 1988) guided the selection of the categories used in this literature review. The categories described in the study were broader than those cited previously in this review, yet they were narrow enough to help identify discrete subdivisions of skills. The study listed these basic skills categories: (a) learning to learn; (b) reading, writing, and mathematics; (c) communication; (d) adaptability (creative and critical thinking and problem solving); (e) personal management (self-esteem, goal setting/motivation, and personal/career development); (f) group effectiveness (interpersonal skills, negotiation, and teamwork); and (g) influence (organizational effectiveness and leadership).

Most literature on basic skills fell naturally into one or more of these categories. However, other key documents indicated a need for additional categories. For example, a more recent study funded by the U.S. Department of Labor (SCANS, 1991), included **technology** as one of five key areas of basic skill competence needed by individuals in America's workplace. **Science** was yet another category that appeared in the literature (Knold, 1986; Bishop, 1985). Project 2061: Science for All Americans, published by the American

Academy for the Advancement of Science [AAAS] (1989), focused on the need for Americans to have a basic understanding of science. In acknowledgement of these studies, technology and science were added as the eighth and ninth categories of basic skills in this literature review.

Finally, our own epistemological framework, grounded in the human development and home economics disciplines, suggested a need for a specific emphasis on balancing family pressures with those of education and work (Way, 1991; Kline & Cowan, 1989). Although the nine previous categories all contribute to success in home and family life, the literature convinced us of the need to add a tenth and final category of basic skill. Thus, **home/family management and relationships** was added to the list.

The categories of basic skills reviewed in this document, then, are organized around the following ten categories: (a) learning to learn; (b) reading, writing, and mathematics; (c) communication; (d) adaptability (creative and critical thinking and problem solving); (e) personal management (self-esteem, goal setting/motivation, and personal/career development); (f) group effectiveness (interpersonal skills, negotiation, and teamwork); (g) influence (organizational effectiveness and leadership); (h) technology; (i) science; and (j) home/family management and relationships. A detailed review of the literature documenting the legitimacy and viability of each of these categories of basic skills is presented below.

Learning to Learn

Workers must be able to assimilate new information, adapt to new technologies, and prepare to be occupationally mobile (Zuga & Lindstrom, 1989). As competition forces American industry into new patterns, workers will be required to shift from one job role to another and accept changing responsibilities. Workers will be required to absorb, process, and apply new information quickly and effectively (Carnevale et al., 1988; Champagne, 1986). To do this, individuals must be skilled at integrative thinking — the ability to use disparate sets of skills and concepts interactively under changing conditions (Chisman, 1989).

Thus, the ability to learn and apply new skills is becoming more and more important, based on estimates that people will need to learn new skills in the workplace every two to three years (Miguel, 1985). Learning to acquire new skills gives the worker the ability to adapt (Blai, 1989) and solve problems (Crismore & Mikulecky, 1987). Future workers need to consider education as a continuous process throughout a working lifetime (Ten Recommendations for Improving Secondary Vocational Education, 1985; Champagne, 1986). Learning to learn adds transition skills which provide the ability to move easily from one occupation to another (Patterson, 1985).

Learning to learn appears to be the most basic of all skills. It enhances the application of other basic and higher order skills, providing the key to future success.

Individuals who have the ability to learn and apply new skills interactively can achieve competency in all other skills, from basic reading to leadership (Carnevale et al., 1988; Champagne, 1986). Learning to learn proficiency appears to be acquired through a variety of student experiences within the total educational curriculum (Foodservice Subject Matter Update, 1986-87). A school curriculum with learning to learn as a priority would include a liberal arts education of reading, literature study, writing, mathematics, social studies, and science. The curriculum would also emphasize the ability to start, continue, and complete tasks within a given time (Patterson, 1985). Beyond these curricular elements, however, students who are learning to learn also require opportunities to explore how the content of what they have learned can be combined in different ways to achieve new understandings.

Reading, Writing, and Mathematics

Although the skills required for the jobs of the future will be more complex than in the past, the abilities to read, write, and compute will remain essential. In fact, the required level of competency in reading, writing, and computation will increase. Possessing these "traditional" basic skills will relate directly to workers' success in an increasingly complex work environment (Buskirk, 1988).

In its 1989 publication, "Everybody Counts: A Report to the Nation on the Future of Mathematics Education," the Mathematical Sciences Education Board of the National Research Council [NRC] stated:

> **Reality:** Today's world is more mathematical than yesterday's and tomorrow's world will be more mathematical than today's. As computers increase in power, some parts of mathematics become less important while other parts become more important. While arithmetic proficiency may have been "good enough" for many in the middle of the century, anyone whose mathematical skills are limited to computation has little to offer today's society that is not done better by an inexpensive machine. (p. 45)

This study indicates that the importance of mathematics (more sophisticated mathematics) as a basic skill is increasing. Over 75% of all jobs require proficiency in simple algebra and geometry, either as a prerequisite to a training program or as part of a licensure examination (National Research Council, p. 4).

Reading skills are essential at all levels of employment and are correlated with superior job performance (Mikulecky & Ehlinger, 1986). Writing ability is also important. Mikulecky (1982) found that of the 276 writing tasks required to perform jobs listed in the Dictionary of Occupational Titles, more than 42% involved filling out prepared forms and more than 22% involved generating memos or letters. Another 25% of job writing tasks required recording, summarizing, or noting work completed. Clearly, writing is a skill that is required for successful employment and advancement.

Communication

Communication skills reflect how well individuals get along and how effectively they interact with their peers (Semple, 1987). Communication involves both verbal and nonverbal expression through writing, comprehension, speaking, listening, conversation giving, receiving instructions, and attending to others in a positive way (Fitzgerald, 1986; Carnevale & Johnston, 1989; Carnevale & Gainer, 1989; Ten Recommendations, 1985; Bailey & Novelle, 1989; Carnevale et al., 1988). Generally, people communicate by listening and speaking. People spend a great deal of their day in some form of communication: on average, 8.4% of their time writing, 13.3% reading, 23% speaking, and 55% listening (Semple, 1987, p. 11).

The ability to express oneself clearly to others and listen carefully and actively are important worker competencies (Patterson, 1985). Success on the job is linked to good communication skills; only job knowledge ranks higher as a factor in workplace success (Semple, 1987; Welter, 1989; Carnevale et al., 1988). Although communication involves skills other than writing, employees of the future must also be able to write under complex conditions. Writing, as with speaking, relies on abilities in the areas of analysis, conceptualization, synthesis, and distilling of information. Writing requirements in the workplace of the twenty-first century will likely be characterized by a shift from relatively long narrative to clear, succinct articulation of thoughts (Carnevale et al., 1988).

Adaptability

Adaptability includes creative thinking, critical thinking, and problem solving (Carnevale et al., 1988). As workers become more autonomous within the workplace (Blai, 1989), adaptability will become more necessary. Being able to think creatively and critically and to solve problems enables workers to make well considered decisions. More specifically, these skills will provide employees with the ability to generate alternatives, estimate outcomes, assess probabilities, and take action and risks (Carnevale et al., 1988).

Skills in problem solving and critical and creative thinking include the abilities to plan, analyze, synthesize, evaluate, organize, and manage information (Patterson, 1985), and to set priorities for determining alternatives (Fitzgerald, 1986). Problem solving requires an understanding of the processes needed to apply knowledge. These skills provide the worker with the ability to detect a problem, find or invent a range of probable solutions, choose the most appropriate solution for the conditions, and track and evaluate results (Crismore & Mikulecky, 1987).

An assumption made frequently in the literature of applied academics is that students retain information more readily if they have used that information to solve problems. Responding to this assumption, the medical field is beginning to embrace the use of problem based learning, and has developed instructional processes which require students to apply knowledge through the use of case studies. The literature suggests that medical students may learn better through a combination of problem based learning and applied academics than through traditional instruction (Cardiff, 1986).

A report by the Association of American Medical Colleges Project Panel (cited in Schmidt, Dauphinee & Patel, 1991) suggested sweeping changes in the way medical schools deliver professional training. The panel suggested offering education that requires students to be active, independent learners and problem solvers rather than passive recipients of information. These recommendations have been taken seriously by the medical profession, and medical schools around the world have begun to adopt a problem solving model over the past ten years. Some of the medical schools have maintained both types of instruction: a conventional, lecture oriented approach, and a problem based, case study approach. Comparisons, therefore, are relatively easy to make, and preliminary results of these comparisons have yielded equivocal results. Schmidt et al. (1991) reviewed the results of 15 studies comparing the outcomes of problem based/community oriented medical curricula with those of conventional programs. Surprisingly, the differences in achievement show that students of conventional schools scored significantly higher at the end of their four years of study than those in schools where problem based instruction was dominant.

In a related study (Santos-Gomez, Kalishman, Rezler, Skipper, & Mennin, 1990), 130 medical school residents were compared on the basis of their performance in a problem based medical curriculum and a parallel conventional track. Eight criteria were examined: knowledge, communication with patients, independent learning ability, teamwork, patient education, critical thinking ability, attention to health care costs, and self assessment. Significant differences were observed only in the areas of attention to health care costs and communication with patients; students in problem based learning programs performed better than students in conventional training programs.

Newble and Clarke (1986) also compared problem based instruction with traditional instruction in medical schools and found evidence that students who have experienced the problem based approach to learning appear to have an orientation to future learning which more closely approximates the aims of medical schools. Shahabudin (1987) reported that regardless of whether or not lectures had been given, students recalled facts better if they had encountered a related clinical problem through a case study, one of the key elements of problem based instruction.

Heale, Davis, Norman, Woodward, Neufeld, and Dodd (1988), in a randomized controlled trial, found that problem based teaching in the undergraduate program promoted better recall by students. The problem based group scored significantly higher than the lecture taught group on the knowledge test, chart audits, and treatment of simulated patients (p. 74-76).

Arand and Harding (1987) found that performance on a test of critical thinking was affected by one course designed to introduce allied health students to problem solving. The study demonstrated consistent, positive effects of a problem solving course taught early in the students' educational program. Although improvements in critical thinking were delayed, not being evident until a year later, statistically significant improvements in grade point average were evident much sooner than that.

Norman (1988) has offered an alternative explanation for the positive effects of problem based learning. The author concludes that evidence from a variety of fields of inquiry shows that clinical expertise is characterized, not by the possession of any superior general thinking strategy such as critical thinking, but by the availability in the student of an extensive, organized body of specialized knowledge. In other words, in order to be a critical thinker or problem solver in any specific field of study, an individual must have an extensive knowledge base in that field, and problem based learning may simply allow students to learn more information more efficiently than they can by traditional instruction. Rather than enhancing the ability to apply or understand existing information, the author concludes, problem based learning may enhance the ability to acquire and retain new knowledge.

Personal Management

Personal management includes such skills as goal setting, self motivation, personal and career development, and the ability to acquire and maintain self-esteem. Dramatic changes in the workplace have made personal management an essential skill (Welter, 1989; Carnevale & Gainer, 1989; Berryman, 1988). Workers with these skills have the tools for expanding their skills inventory, can manage and cope with change more effectively, and are more productive in their work (Carnevale & Johnson, 1989; Pucel, Devogel, & Persico, 1988).

As the workplace continues to change and as workers become more autonomous (Blai, 1989), a worker's well developed sense of self-esteem becomes critical. Self-esteem allows workers to develop confidence in their ability to do their work and to adjust as conditions change around them. Carnevale et al. (1988) suggest that individuals can be trained to increase their own self-esteem.

Key components of self-esteem training include helping employees: (a) recognize their current skills; (b) be aware of their impact on others; (c) understand their emotional set-points and abilities to cope with stress, change, criticism, and so on; and (d) recognize their own limits and seek new information to apply to problems when necessary (p. 13).

Workers with personal management skills demonstrate a more sophisticated awareness of themselves as individuals with marketable talents and abilities. They recognize the need for adding to their skills inventory and can be proactive in dealing with the frustrations of the workplace. These characteristics are becoming increasingly important with the increased complexity and changing demands of the workplace. Lack of these skills is suggested to be the root cause of other problems in the workplace, such as production errors and absenteeism (Carnevale et al., 1988).

Group Effectiveness

Due to the pooling of resources in most industries, workers are being asked to perform a multiplicity of tasks. To perform these tasks, workers must have an array of social skills that individual or routine jobs do not require (Carnevale et al., 1988). Included in this array are a variety of human interaction skills that fall under the general rubric of group effectiveness skills.

Group effectiveness skills are considered the cornerstones of successful teamwork (Carnevale et al., 1988). As industry increases the use of worker teams to enhance productivity and to downsize middle management, these skills are becoming increasingly important (Executive Report, 1989). Successful performance in work settings that require autonomous teams depends upon a worker's ability to interact, defuse conflict, and develop a sense of group purpose (Carnevale et al., 1988). Group effectiveness skills are also essential for service industry occupations in which employees encounter and must respond satisfactorily to customer complaints (Carnevale & Johnston, 1989).

Group effectiveness includes interpersonal skills, negotiation skills, and the ability to work cooperatively with others (Buskirk, 1988; Carnevale & Johnston, 1989). Specific skills associated with group effectiveness include attending to others in a positive way (Fitzgerald, 1986), resolving conflict, managing stress, establishing networks with others (Patterson, 1985), and performing well in group interaction settings (Bailey & Novelle, 1989).

One of the most important interpersonal skills associated with group effectiveness is conflict resolution. Conflict is a natural condition resulting from individual differences in values and opinions. As worker teams encounter conflict situations, team members must be able to resolve them, most often through achieving consensus.

Influence

Influence refers to the impact of a member upon an organization. It comprises (a) organizational effectiveness, which is the ability to understand how the parts of an organization function together, and (b) leadership, which is the ability to guide the process by which one or many of those parts function smoothly. Workers need to have a sense of how their actions affect the ability of the organization to meet its goals (Carnevale & Johnston, 1989).

All organizations have a culture. The culture of the organization and the worker's ability to function within that culture become as important as specific job skills held by the worker (Carnevale et al., 1988). With an understanding of what the organization values and how that is operationalized, workers become fully functioning, productive, and empowered members of the organization. Once a worker understands the organization's culture, leadership skills can be used in positive and productive ways. To remain competitive, industry needs its employees to be able to assume responsibility and motivate others (Carnevale et al., 1988).

Technology

The Secretary's Commission on Achieving Necessary Skills (SCANS, 1991) has produced a set of basic skills projected to be of increasing importance for workers in the year 2000. This set of skills considerably overlaps that of Carnevale et al. (1988). The SCANS report differentiates five competency areas (use of resources, working with others, use of information, understanding of complex systems, and working with technology), and three foundation sets of skills (mathematics and communications, thinking, and personal qualities). Technology is the one major competency area included in the SCANS report that was not also included in the report of Carnevale et al.

The SCANS report concludes that workers need to be competent in three general areas relating to technology: appropriate selection, effective application, and successful maintenance and trouble-shooting. The SCANS conclusions are supported by those of another national study, Project 2061: Science for All Americans (AAAS, 1989). Like the SCANS study, the AAAS study states that technological knowledge is and will remain a key skill for current and future members of the workforce. Understanding new technologies is a basic skill that will become increasingly important to

American workers' competitiveness in a global economic environment and a rapidly changing workplace (NRC, 1989; AAAS, 1989; Durenfurth & Kozak, 1991; SCANS, 1991).

Science

It was surprising to discover that many of the frequently cited national reports exclude science as a discrete basic skill. This review has relied heavily upon the conception of basic skills outlined in Carnevale et al. (1988), a source often cited as an exemplary "basic skills document." However, both the Carnevale report and SCANS (1991) omit science as a competency area.

In contrast, other national reports focus on science as the key missing component responsible for the United States' reduced ability to compete in a global market (AAAS, 1989; Knold, 1986; Bishop, 1985). And even the reports that omit science as a primary competency area often include many of the competencies traditionally associated with science, such as critical thinking, problem solving, interpreting, and evaluating. For these reasons, this review includes science as a key basic skill category.

Home/Family Management and Relationships

Data collected in the past five years have emphasized the interrelationship between success at home and success in the workplace (Way, 1991; Kline & Cowan, 1989). Personal management is directly related to family management (Goldsmith, 1989). Group effectiveness, influence, adaptability, communication skills, and the love of learning all begin in the home (Goldsmith, 1989), as does interest in technology, science, reading, writing, and mathematics (Felstehausen & Schultz, 1991). Thus, successful family and home management skills may enhance the acquisition of other basic skills in school and may support the demonstration of those skills in the workplace. This assumption supports the philosophical framework upon which this review is founded — that strong academic, thinking, and interpersonal basic skills stem from success at home. Consequently, we have included home/family management and relationships as part of the theoretical set of basic skills.

Focus Question One: Summary

The first focus question asked, "How are basic skills defined?" Given the most recent evidence from the literature and the philosophical framework of this review, there appear to be ten categories of basic skills youth need to assume their roles as adults in the workplace. Those categories include the following: (a) learning to learn; (b) reading, writing, and mathematics; (c) communication; (d) adaptability (creative and critical thinking and problem

solving); (e) personal management (self-esteem, goal setting/motivation, and personal/career development); (f) group effectiveness (interpersonal skills, negotiation, and teamwork); (g) influence (organizational effectiveness and leadership); (h) technology; (i) science; and (j) home/family management and relationships. Thus, these ten categories of skills provide an operational definition of the term "basic skills."

Focus Question Two

"How successfully are those who are about to enter the workforce acquiring basic skills?" To answer this question, reviewers looked at literature that addressed the following issues: the degree to which our youth are prepared to compete in global markets, and employers' perceptions of vocational education's effectiveness in preparing youth for the demands of the workplace.

Global Competitiveness of the Workforce

As the United States' domination of the world's economy diminishes (Fitzgerald, 1986; Owens, 1989), the skill level of the workforce has come under increased scrutiny (Bishop, 1988; Berlin & Sum, 1988; Dronka, 1988; Fitzgerald, 1986). Many factors affect the quality of American industry and the position that the United States holds in the competitive international marketplace. Many recent reports claim that our current workforce lacks essential skills (Chisman, 1989; Carnevale et al., 1988; Carnevale & Gainer, 1989; Owens, 1989; Lee, 1988; Executive Report, 1989; SCANS, 1991). Carlivati (1990) reported that the United States faces major problems as a result of the widening gap between labor skills needed by industry and those presently held by workers.

Although a great deal has been written regarding the skills gap, there is no comprehensive information explaining whether this lack of skills stems from a deficiency of behavioral and/or operational competencies (Anderson & Steward, 1989). Techniques currently used to measure skill levels are considered unsatisfactory (Chisman, 1989). Regardless of how accurate these techniques are, what is clear is that employers are dissatisfied with the degree of knowledge and skills possessed by youth entering the workforce (Executive Report, 1989; Bottoms, 1989; Carnevale et al., 1988). This problem directly affects the country's economic position (Pucel et al., 1988). Carnevale et al. (1988) indicate a well defined linkage between the skill level of the existing workforce and the ability of employers to make changes necessary to remain competitive in the global marketplace. The basic skills outlined earlier in this review are those that employers most often identify as necessary for a better trained workforce.

Performance of Vocational Education

Students who completed vocational education programs in the late 1970s and early 1980s were well tracked in numerous follow up studies. However, information on employer satisfaction with vocational education graduates has greatly diminished since then, probably due to the relaxation of the VEDS (Vocational Education Data System) follow up requirements in P.L. 98-524. Only one relatively recent statewide survey emerged in the literature search. The South Carolina State Council on Vocational and Technical Education (1986) conducted a mail survey of more than 1,200 employers from that state. The purpose of the survey was to gather information regarding South Carolina employers' perceptions of and experiences with vocational education, its graduates, and entry level workers in general. Results of the mail questionnaire revealed that:

1. Among the employers from various sectors who participated in the survey, over 31% said they were not getting enough qualified applicants for entry level positions. Applicant shortages were most acute in the construction industry (building, masonry, etc.).
2. Over 60% of the respondents who hired bank tellers, sales clerks, some types of production/assembly workers, and customer oriented service workers (food, beverage, hotel, janitorial) said these employees typically require on-the-job training (OJT). Pre-employment occupational training appeared to be most important in construction (skilled jobs), finance, insurance, transportation (drivers), and mechanical service/repair industries, but these employers also provided some OJT. Workers employed in client service occupations (health, social services) and in secretarial fields were expected to need little OJT.
3. The four worker characteristics most preferred by employers were: good work habits and attitudes, interpersonal skills, specific job skills, and prior work experience.
4. Nearly three fourths of all respondents said they preferred to hire workers who had received vocational training over those who had not received training. Nearly one half of the employers surveyed said they benefitted directly from secondary vocational education programs, usually because graduates of these programs performed well and required less additional training; another one fourth of the respondents said they had little experience with vocational education programs because they hired few employees or required an advanced degree for most positions; the remaining one fourth said they failed to

benefit from vocational education programs due to lack of knowledge about such programs and lack of appropriately trained workers, or dissatisfaction with those interviewed or hired. Employers in the manufacturing sector and those employing a large workforce (over 50) benefitted most frequently from vocational education programs.

5. Nearly all (90%) of the respondents said that "encouraging the development of good work habits such as dependability and job commitment" should be a priority role for vocational education. Providing job specific training for non-college-bound students and teaching the application of basic skills in various occupations were also identified as important.
6. According to the employers surveyed, the most relevant accountability measure for vocational education programs should be the satisfaction of employers who hire vocationally trained workers. These employers also ranked training-related placement rates and program responsiveness to local needs as important measures of program effectiveness.
7. When asked how vocational education programs could better serve their needs, employers responded with answers similar to those obtained in other such ratings. The majority of employers cited the following ways to meet their needs: role modeling positive work habits and attitudes, developing or expanding specific programs, building closer ties to business and industry, and placing more emphasis on the teaching of basic skills.
8. Industry developments expected to have the greatest impact on training needs included "computers" (application, not necessarily programming or repair), automated production equipment, and electronics. In service industries, many employers cited the growing need for good communication and customer relations skills.

Although these results are limited to South Carolina, they appear to reflect vocational education needs in other states. In Tennessee, for example, 60% of employers surveyed agreed that high school students have low levels of basic skills (Petty, McNelly, & Serle, 1989). To be globally competitive, students will need the help of vocational educators in acquiring and learning to use these skills.

Focus Question Two: Summary

Studies vary in the way they categorize basic skills, but their results reflect general agreement among employers on the importance of these skills and the direct influence they have on job performance. The United States is

falling behind other developed countries in its ability to compete in areas such as the production of goods. Academic test scores of U.S. public school graduates are also declining. Most employers would not answer affirmatively if asked Focus Question Two, "How successfully are those who are about to enter the workforce acquiring basic skills?" Vocational education may be able to serve as an ameliorative force, helping to improve the country's economic and scholastic forecasts. While some continue to support the conceptual or symbolic role of secondary vocational education programs (Kliebard, 1990), most employers support the idea of these programs serving as conduits of the practical, basic skills that new members of the workforce must have to succeed on the job today.

Focus Question Three

"Why do those who are about to enter the workforce vary in the degrees to which they possess basic skills?" The literature suggests that several demographic and workplace literacy issues, along with school curriculum concerns, affect the degree to which students acquire basic skills.

Changing Demographics of the Workplace and Workers

In the past, the solution employers used when facing a skill level deficiency was to raise wages and attract individuals with greater skills (Welter, 1989). The nature of today's workforce has made this practice less successful. Shifts in both size and nature of the labor pool have altered hiring practices (Chisman, 1989).

Size of the Labor Pool

The demographic profile of today's labor pool is significantly different from that of only a few decades ago. The baby boom era has passed, leaving a declining number of entry level workers (Lee, 1988; Feldman, 1987; Strumpf, 1986). Berlin and Sum (1988) reported a decrease in the total size of the young adult population. The total number of young adults is predicted to decline by more than one fourth between 1979 and 1995 (Berlin & Sum, 1988, p. 24). As fewer young adults enter the workforce (Miguel, 1985), employers will have to reach further into the labor pool to meet their needs. This may lead to the hiring of workers whose skill levels are insufficient to meet the demands of the job (Strumpf, 1986; Carnevale et al., 1988).

Nature of the Labor Pool

A larger share of this declining pool of entry level workers will be composed of women, minorities, and disadvantaged groups (Berlin & Sum, 1988; Carnevale et al., 1988; Pritz, 1988; Strumpf, 1986; Wade & Williams, 1988). The Executive Report of the Jobs for Indiana's Future (1989) confirmed that "the labor force growth between 1980-87 was 15 percent female and 3 percent male" (p. 12).

As a group, individuals who will become the new workforce have been less successful in school than previous generations of workers (Lee, 1988). As a result, they will enter the labor market further behind than their predecessors in development of marketable skills (Executive Report, 1989; Bottoms, 1989). A large proportion of these individuals will lack many of the traditional basic skills such as adequate reading and writing abilities, which will in turn prevent them from gaining and holding good jobs (Chisman, 1989). No empirical literature was located documenting how women, minorities, and disadvantaged groups compare to the general labor force regarding possession of basic skills. The general perception, however, is that these individuals are at least as lacking in these skills as other new workers.

At first, the way to remedy skill level deficiencies in women, minorities, and disadvantaged groups appears to lie in improving their educational experience. The problem, however, is much more complex. Lack of basic skills may be the tip of the iceberg, signifying far more serious problems. In a survey of disadvantaged youth with low basic skills, Carnevale and Johnston (1989) found "68 percent had been arrested, 85 percent were unwed mothers, 79 percent were welfare dependents, 85 percent were dropouts, and 72 percent were unemployed" (p. 14).

Berryman (1988) suggested that factors other than learning abilities produce these statistics. She stated:

> All individuals develop an image of their niche in the adult world in the ecological sense of niche. The research shows that they work out notions of their basic futures and of the trajectories relevant to them. . . . Differences may partly reflect differences between at-risk and not-at-risk learners in their visions of their adult places in the world. (p. 11)

Similarly, Miguel (1985) suggested that success in the labor market is not dependent simply upon skill levels but is also a result of an individual's locus of control, which helps to determine behavior and choices.

The empirical research dealing with minorities in the labor force, therefore, suggests that there might be logical connections between development of the locus of control and the ecological niche within minority populations (Berryman, 1988). Fitzgerald (1986) asserted that although the

relationship between education and work status is positively correlated, the relationship is not as strong for blacks as it is for whites. In fact, "as black educational attainments have been increasing, black labor market position has been deteriorating relative to whites" (p. 258). Even when black youths find jobs, their earnings are consistently below those of white males (Fitzgerald, 1986).

Women also find that job qualifications and level of income are not as well correlated for them as for the general labor force. Employers have traditionally regarded women as high turnover employees (Fitzgerald, 1986, p. 258). They often assume that women will interrupt their careers to marry, have children, or move away in response to their husbands' career demands. These employers may be reluctant to train women employees for advancement, believing that training costs may not be recouped. As a result, women, even if well educated, in general do not earn as much as white males. Women high school graduates employed full time were not financially better off than men who had failed to complete elementary school (Fitzgerald, 1986, p. 259). Black women are even more dramatically affected by such conditions within the workplace. They earn less than any other group in the labor force (Fitzgerald, 1986). It is possible that this negative relative work status is a factor in the occupational choices made by women. Women choose a more limited range of occupations and have lower occupational expectations than men (Mote, Morton, & Marshall, 1986).

Socioeconomic status is directly correlated to choice of occupation; a person in a lower socioeconomic class is likely to choose a lower level job. Groups of workers often found in the lower socioeconomic classes and who generally hold lower level jobs are: ethnic minorities, women, rural youth (Berryman, 1988; Mote et al., 1986), and individuals with handicapping conditions (Harnisch, Chaplin, Fisher, Tu, Decker, & Danielson, 1987a). Between 50% and 80% of all individuals with handicapping conditions are unemployed (Harnisch et al., 1987a), and yet only 38% of those individuals indicate that lack of marketable skills hinders them from working (Harnisch, Fisher, Kacmarek & DeStefano, 1987b). Employed individuals with handicapping conditions generally work in unskilled or semi-skilled positions (Harnisch et al., 1987a), the very positions rapidly disappearing in American industry. It is often assumed that individuals with handicapping conditions are at the bottom of the employment hierarchy due to an inability to acquire necessary and appropriate work behaviors or an inability to transfer acquired skills into other work settings. These assumptions have not been supported by research (Harnisch & Fisher, 1988).

Minorities, women, rural youth, and individuals with handicapping conditions will compose an ever increasing percentage of the labor pool of the future. These populations are often described as having: low self-esteem, an external locus of control, a different work value orientation, an unrealistic attitude toward the world of work, a lack of occupational information, low

performance in school, and less education than others (Mote et al., 1986; Fitzgerald, 1986; Miguel, 1985). In many cases, these conditions help shape vocational choices, which then restrict the ability of these individuals to move upward economically (Fitzgerald, 1986). Minorities, women, rural students, and people with handicapping conditions are more likely to remain in positions which lack upward career movement opportunities, and to be unable to adjust to the changing needs of the workplace (Korcheck, 1987). To make it possible for members of these groups to become productive members of the workforce, new methods of instructional delivery will probably be necessary (Lister, 1985).

Preparing students for the world of work, whether the entrance to work is immediately after high school or after postsecondary education, has been the task of the nation's school system. The elementary and secondary public schools are fairly effective at preparing the college-bound student, but have been less effective in educating and training the non-college-bound student (Carnevale & Gainer, 1989). At one time the employment sector was able to find room for students who left school with less than the optimum amount of educational proficiency, and the income associated with semi-skilled or unskilled employment was still reasonably adequate to support a household. Both of these characteristics of the American workplace appear to be rapidly diminishing.

Workplace Literacy

The workforce is more literate than ever before, but increasing literacy requirements on the job have outpaced gains in worker literacy. Workers at the turn of the century could easily be successful with less than a high school reading ability. Today, technical materials require the ability to read at a 10th to 13th grade level or higher (Bottoms, 1989). In addition, the amount of reading time on the job has increased: "In 1950, about 17 percent of all jobs included information processing tasks; in the early 1980s this had reached 54 percent and it continues to rise" (Blai, 1989, p. 12). Bottoms (1989) indicated that literacy requirements are increasing in a broad range of American industries. Lee (1988) reported that 98% of all occupations require a worker to read for an average of 61 to 113 minutes each day.

Because of these increased literacy requirements, approximately 27 million American adults now rank as functionally illiterate. Functional illiteracy is defined as a reading ability at or below the fifth grade level. Another 45 million, considered only marginally literate, read above a fifth grade level but not well enough to meet the requirements of the workplace (Jurmo, Wiggenhorn, Packer, & Ziegler, 1989). These individuals are often chronically unemployed, or employed in unskilled jobs (Lee, 1988).

The problem of the literacy gap in American industry is becoming more and more critical. By the year 2000,

> approximately 40 percent, or 10 million jobs, will be professional and technical positions requiring language skills of level 4 or better. (A U.S. Labor Department standard rates jobs on a scale of 1 to 6. A Level 1 job requires a vocabulary of 2,500 words and the ability to write a simple sentence. A Level 6 job requires the use of technical journals, financial reports, and legal documents.) Another 58 percent, or 15 million jobs, will be marketing and sales, administrative, services, supervisory, and similar positions requiring skill levels between 2 and 3.9. (Level 2 requires a vocabulary of 5000-6000 words, a reading rate of 190-215 words per minute and the ability to write compound sentences. Level 3 requires ability to read safety rules and equipment instructions, and the ability to write simple reports). Only 2 percent, or about a half million jobs, will require language skills less than 2.5. (Dunn-Rankin & Beil, 1989, pp. 3-4)

The definition of literacy is also expanding to include technological literacy. Employers are becoming increasingly dependent upon the technological skills of their workers (Carnevale & Gainer, 1989a; Carnevale et al., 1988). Today, the added skill level required by employers is, in part, a result of the increased technology used in the workplace (Jurmo et al., 1989). The heightened skill requirements imposed by increased technology appear to be a primary contributor to a growing problem: A gap is widening between the basic skills employers need in workers and the types and levels of skills those workers actually possess (Lee, 1988). Skills which once would have allowed a worker to move from an unskilled labor classification to a semi-skilled classification are now considered necessary for entry level (Lee, 1988; Carnevale et al., 1988; Executive Report, 1989; Blai, 1989; Patterson, 1985). For example, the banking industry now considers a two year college degree as entry level for positions that once were classified as clerk-typist positions, due largely to the computer based skills necessary in almost any banking position (Bailey & Novelle, 1989).

The upward shift in skill level requirements is not new: Each generation of workplace innovations has called for increased skill levels. The difference today lies in the rapidity of the upward shift (Patterson, 1985).

Patterson (1985) cites the work of Christopher Deed, a futurist at the University of Houston at Clearlake. Deed defined the term "occupational skill half-life" as the time that it takes for half of the knowledge, training, and/or skills of an occupation to become obsolete. During the first half of the twentieth century, an occupational half-life was estimated at approximately 25

to 40 years for most occupations. Today, workers face an occupational half-life between four and five years, and for technical occupations, 18 months. As Patterson (1985) has indicated, the speed at which new information reshapes occupations in the information age is at least five times faster than the rate at which changes occurred in the industrial age. This leap into the information age has led to an unprecedented demand for process skills in employees. Change is occurring so rapidly that the workforce of the year 2000 will need to develop the skills necessary for their immediate work and the ability to adapt quickly to increasing demands of the future (Blai, 1989).

The Characteristics of the School Curriculum

School systems' ability to meet the needs of non-college-bound students may still be questionable. Very little current empirical evidence exists documenting the academic success of vocational completers compared to other students (Bottoms, 1989). Bottoms (1989) found that many administrators, teachers, and students in secondary education perceived vocational classes as easy electives. This perception is consistent with a commonly held belief that the vocational education curriculum is a less intellectually rigorous one than is the college preparatory curriculum. Requiring that vocational education students meet the same academic standards as nonvocational students is necessary (Bottoms & Korcheck, 1989), and may help raise the academic skill levels and professional confidence of vocational students.

Focus Question Three: Summary

The literature suggests that, in general, American youth are substantially lacking in the contemporary basic skills needed in today's workplace. A primary reason for this is that more students than ever before are at-risk economically, culturally, and, therefore, academically. At the same time, the number of secondary and postsecondary students is declining, requiring employers to hire workers not properly trained or motivated for the positions needing to be filled. An additional dilemma stems from two concurrent trends in the workplace: fewer positions for unskilled workers, and an increase in the technological complexity of semi-skilled and skilled positions. To date, the vocational education curriculum — potentially a means by which many young workers could equip themselves with the essential basic skills — has yet to respond to these changes in the emerging workforce and become an effective provider of professional empowerment.

Focus Question Four

"How can weaknesses in the basic skills of the workforce be remedied?" To investigate this question, literature related to school change and business/industry training programs was reviewed.

Bottoms (1989) suggested that, rather than increasing coursework to address basic skills needs, schools consider developing vocational education study programs. This kind of study program would fundamentally change what individuals would learn, how they would learn it, and who would need to learn it (Berryman, 1988; Executive Report, 1989). Vocational education would then serve two purposes: preparing students for immediate work and for continued learning, either in a work setting or an educational one (Bottoms, 1989).

Dunn (1988) reported that, as employers have begun to require more highly skilled workers, basic academic skills are becoming the content of vocational education. Fitzgerald (1986) indicated that what were once considered vocational competencies are now valued in all students. When teachers and the general public were asked what skills students should have regarding work, they offered four broad categories: (a) traditional job values such as good work habits and attitudes, (b) job advancement and promotions skills, (c) risk taking and personal responsibility skills, and (d) career decisionmaking skills.

There is some evidence that schools are attempting to combine instruction in basic skills and vocational education. In a recent study of 893 vocational classrooms in 120 high schools across 24 states, it was found that basic academic skills were a part of instruction at 62% of the sites. Explicit attempts to enhance basic skills, however, were noted in only 2% of the cases (Owens & McClure, 1989), indicating that students still are not being adequately prepared with skills required by the modern workplace (Owens & McClure, 1989).

Business and Industry Training Capabilities

Chisman (1989) estimated that 75% of the labor market of the year 2000 is presently in the workforce. Changing the educational system will not improve the insufficient skill levels of these individuals. The burden of improving the skill levels of the existing workforce will most likely reside with business and industry training programs. In 1983, 75% of the largest corporations in the United States offered some type of basic skills training for their current employees, and nearly one fifth of organizations with more than 50 employees provided some form of remedial basic skills education (Lee, 1988). In many cases, however, the training being delivered was not targeting

the groups with the most significant needs, as a great deal of the training monies were being spent on workers in white collar and technical positions (Carnevale et al., 1989a).

While large corporations have discovered that the commitment to basic skills training is cost effective (Lee, 1988), such training is expensive. Carlivati (1990) reported that American businesses spend in excess of 25 billion dollars each year in what might be called pre-remedial training. Pre-remedial training is training necessary to develop workers into avid new-skills learners.

For small businesses, training presents numerous problems (Sticht, 1986). Small businesses have not traditionally been involved with training, and therefore are often not ready to assume the role of trainers or the expense of training programs. Their managers do not know how to think about training, and they are uninformed as to what training is available or where to begin (Executive Report of the Jobs for Indiana's Future, 1989). Many small businesses do not have a sufficient number of employees to permit them to offer training during the work day. They need their employees on the job, all day, everyday, and can ill afford the lost work time required for effective training (Bottoms, 1989; Carnevale et al., 1989a).

Half of all present jobs are located in small businesses. It is estimated that as many as 40% of all new jobs being created will be in that sector (Carnevale et al., 1989a). Patterson (1985) reported that approximately nine million new jobs will be created by small business in the 1980s, 10 times the growth rate of this sector in the 1970s.

Focus Question Four: Summary

The challenge facing vocational educators is to help students become ready to function in an ever changing workplace, rather than to help them become proficient at a few specific tasks (Dunn, 1988). This workplace competence will allow students to adjust rapidly to increased demands and changing job requirements, skills significantly different from those needed in the past (Jurmo et al., 1989).

Industry wants workers who can think, get along with others, and adapt to change (Dees, 1990). To provide such resilient workers, educators must insure that all students, regardless of their immediate plans after high school, receive instruction in basic skills.

Society is demanding that students be prepared to encounter real work situations (Lister, 1985). Although teachers can apply a variety of techniques to help students learn basic skills, the foundation of these techniques is likely to be the development of an integrated instructional program applying academic skills in the context of an occupational area (Pritz, 1988; Bottoms & Korcheck, 1989). Vocational education cannot afford to remain an isolated part of the school experience, one which focuses only upon specific job

preparation. It must make academic skill acquisition part of the instruction in vocational task proficiencies (Dorsten & Smink, 1988). It must be integrated with academic education to create well rounded individuals (Owens, 1988). It can demonstrate to students the need for the academic and functional proficiencies that define basic skills.

Focus Question Five

"In what ways can liberal arts and vocational education be integrated?" Although the task of bridging academic and vocational education curricula is significant, natural connections exist. Common skills are needed in both sets of curricula (Dunn, 1988; Pritz, 1988). Academic skills are embedded in vocational education (Naylor, 1988; Pritz, 1988). The skills found in both curricula, such as communication skills, learning to learn skills, and problem solving skills, are neither academic nor vocational in nature (Korcheck, 1987).

Educators must restructure education to meet the needs of the labor market and the academic community. In essence, this restructuring will integrate the vocational and academic curricula into one educational enterprise (Feldman, 1987). An integrated educational enterprise will mean a change from a liberal education based upon a humanities curriculum to a liberal education based upon an applied science curriculum (Dunn, 1988).

The Processes of Integration

Integrating curricula has this result: Academic and vocational skills are taught together to increase the ability of the student to learn basic skills and apply these skills in the real world (Strumpf, 1986; Burrows, Ginn, Love, & Williams, 1989). Each curriculum, vocational and academic, can teach students important concepts. Alone, each provides a part of the content students need; together, academic and vocational contents provide a holistic educational experience (Fitzgerald, 1986; Wade & Williams, 1988). Because the difference between theory and application is often difficult for students to grasp, instruction must be redesigned to insure that acquisition and application of basic skills produces increased knowledge (Dronka, 1988; Burrows et al., 1989).

Advantages of Integration

The challenge of bridging the two curricula can be met using an applied approach to teaching basic workplace skills (Carnevale et al., 1988). Curricula with an integrated approach enhance learning because they accommodate the basic tenets of skills instruction. They allow for both the systematic and sequential development of information (Burrows, Ginn, Love, & Williams, 1989). With curriculum integration, information seeking can be

taught as a thinking process, with less emphasis on the tools used to find the information and raw results of the search (Burrows et al., 1989; Vocational Education and Connecticut's Common Core of Learning, 1988; McBride, 1990).

Bottoms and Korcheck (1989) provide an excellent argument for the need to integrate academic and vocational education:

> The thinking and problem-solving skills of high school students will develop more readily if they understand the connection between what they are learning and how it can be used. One way students can achieve this insight is if meaningful applied learning activities are integrated into communication, mathematics and science courses and if essential concepts and skills from these courses are coordinated with instruction in vocational courses. Once students understand the application of academic knowledge they are far more likely to recall and apply information than if they rely on rote memorization. (p. 3)

Although Bottoms and Korcheck were referring to high school students, the concept is also finding acceptance within the medical profession. The General Professional Education of Physicians Report (cited in Cardiff, 1986) has challenged medical educators to place less emphasis on transmitting information and more emphasis on teaching students to be lifelong learners and to know how to identify and solve problems. The report promoted the use of applied courses to teach these skills.

In our public schools, many skills are taught in isolation from their application, and students are not given the opportunity to apply these skills to real world problems (Bottoms, 1989). This lack of application explains why skills learned in school do not easily transfer to the workplace (Crismore & Mikulecky, 1987). Pritz (1988) suggested that combining the teaching and application of skills will change the learning context so that academic skill achievement will be enhanced. It is expected that with enhanced skills, more students will be motivated to remain in school, high school graduates will be better equipped to perform in the workplace, and all will function better in society.

Functioning well in the future will require students to develop a clear and positive vision of themselves. That vision can be used to apply present learning to future roles (Patterson, 1985). Mote, Morton, and Marshall (1986) conducted a study using integrated curricula and instruction with rural disadvantaged youth. They found that using a personal and applied approach to instruction resulted in significant improvements in student performance. In the three years of the program, only 3% of students did not graduate from high school or receive a GED diploma. Employment results were equally impressive — 68% retained their initial jobs or moved to better positions. The

control group in this study did not experience the same successes. Twenty percent dropped out of school, 10% failed to meet graduation requirements, and only 6% had jobs after graduating. Clearly, in this example, applied approaches to curricula and instruction were advantageous.

Teachers can also benefit from their involvement with integrated instruction. Vocational teachers can learn effective strategies for teaching basic skills and become better at understanding the theory that undergirds many occupational skills (Vocational Education, 1988). The entire faculty needs to be involved in developing strategies to strengthen the basic competencies of students (Dronka, 1988); when academic and vocational instructors work together to develop curriculum designed to coordinate academic skills with vocational instruction, they develop a new awareness of each others' needs and abilities. As a result, communication between instructors can improve significantly.

Phillips (1987) reported an example of this enhanced communication, in which mathematics and vocational teachers worked together to produce workbooks for vocational courses. The courses were designed to be mathematically correct and vocationally appropriate. At the end, the vocational and math instructors had a better understanding of how math is taught and applied in each other's classes.

In other studies involving similar joint efforts by vocational and academic teachers, the academic teachers learned to help students apply basic skills to careers that interested them. Additional benefits for these teachers included increased job satisfaction, increased ability to teach basics and theory, new knowledge of real world applications of theory, a more positive school climate, and acquisition of new teaching strategies (Owens & McClure, 1989; Grosvenor and Thode, 1986). Students in both academic and vocational tracks learned cooperation, increased their ability to transfer skills, enhanced their ability to see the relevance of otherwise unrelated subject matter, increased their ability to work as team members (Owens & McClure, 1989; Budke, 1988; Burrows et al., 1989; Jurmo et al., 1989; Carnevale & Johnston, 1989; Polto & Phen, 1988) and improved their performance academically and vocationally (Bottoms, 1989; Mann, 1987; Phillips, 1987; Cardiff, 1986).

Barriers to Integration

Getting to the point that integration is the norm in school instructional programs will require the cooperation of local schools and state-level policy boards. For most schools, an effort to juxtapose or even interrelate academic and vocational education instruction will require significant changes in organizational delivery. Traditionally, the academic curriculum and the vocational curriculum have been offered in significantly different ways in terms of content, preparation of teachers, funding and administrative structure, and training environment.

For example, the typical secondary vocational education curriculum generally comprises three interrelated but discrete components: in-school skills instruction, out-of-school work experience, and participation in vocational student organizations. Preparation in the academic disciplines, or liberal arts, most often relies on in-school instruction only.

Secondary vocational education instructors often differ in their training background from almost all other groups of public school teachers. Vocational educators can teach without a baccalaureate degree in many states by gaining a credential or teaching certificate based on their related trade experience. Most states maintain a state vocational certification office distinct from the certification board of the State Department of Education.

Historically, the federal government has provided approximately 10% of total vocational education funding (Phelps, 1984). The remaining 90% has come from state and local sources (Benson & Hoachlander, 1981). While this federal share has been proportionately small, it has been significant enough to encourage all but the smallest secondary school districts to pursue those dollars. This federal-to-state-to-local flow-through funding structure has produced curricula and administrative systems that are consistent with and responsive to federal guidelines as much as to local direction. Hence, at least administratively, vocational education typically operates separate from mainstream public education, often with separate administrators, clerical personnel, budgets, and staff meetings.

Finally, secondary vocational education is delivered in four different public school environments — comprehensive high schools, general high schools, vocational high schools, and area vocational centers — while the academic curriculum uses only the first and second of these four options. The extensive use of area vocational centers and, to a lesser extent, vocational high schools, nationwide, has helped segregate vocational education delivery, thus making the integration of academic and vocational curricula difficult.

The lack of state-level policy reinforcing integrated curriculum and instructional delivery is another barrier to implementation, as is existing policy which prevents such integration (Bottoms, 1989). Other barriers include turf issues which separate state-level boards of vocational education from their counterparts in the rest of education in a variety of states (Owens & McClure, 1989), lack of documentation of the specific content each might contribute to instruction (Wade & Williams, 1988; Burrows et al., 1989) and lack of knowledge of specific competencies taught in either academic or vocational classes (Wade & Williams, 1988).

The fear of loss of positions is another barrier that must be addressed. Teachers who fear that positions will be cut due to integration are less likely to put their full support behind it. Similarly, turf issues will remain a barrier if teachers perceive that their positions on integration teams might be inequitable.

Teacher Competencies for Integration

Integration of academic and vocational education works especially well when vocational teachers have broad-based academic skills (Owens & McClure, 1989). To prepare vocational teachers for the future, teacher education programs must assure that teachers have sound basic skills and that they have some academic training in areas such as science (Owens & McClure, 1989; Bottoms, 1989). Colleges who prepare teachers must prescribe choices of electives and general study courses to assure selection of math, communication, and science for vocational teachers (Bottoms, 1989).

The skills teachers need in order to provide for the success of integration reflect those needed by today's workforce. Teaming, cooperative learning, joint planning, and interpersonal skills are examples of proficiencies needed. Teaching at both the higher education and secondary levels isolates teachers and encourages a more narrow conceptual base in the classroom. This is inevitable when a single teacher has sole responsibility for the content taught. Integration requires teachers to break that isolation by collaborating in instructional delivery (Schenka, Jensen, & Wondrasch, 1989).

Teacher preparation programs will need to concentrate on integrated approaches such as teaching prospective teachers to plan cooperatively (Grosvenor & Thode, 1986). Teachers must become sensitive to different learning styles and to a wider variety of applications (Executive Report of the Jobs for Indiana's Future, 1989). Teachers must develop methods to connect the teaching of needed academic competencies with related technical knowledge and skills (Bottoms, 1989; Bottoms & Korcheck, 1989). Teachers must work with employers to strengthen the link between learning in school and learning on the job (Carnevale & Johnston, 1989).

Beginning Integration

The first step to integrating curricula is to gain staff support (Naylor, 1986). The development of mutual respect among academic subject matter instructors and vocational instructors is critical. These instructors must see themselves as part of the same team (Executive Report, 1989). Reflecting this need for team-building, Miguel (1985) recommended strengthening the relationship between academic and vocational disciplines and viewing vocational programs as a way of bolstering the application of basic skills.

In the medical profession, schools have found integration to be most effective when major skills introduced are practiced in specific sequences so that the student can concentrate on one skill at a time. This process is directly related to the success of student learning (Cardiff, 1986; Kelley, Orgel, & Baer, 1985). A major requirement for program success is to make sure the coursework is correlated to a practical or clinical setting (Rose, 1988). Burrows et al. (1989) and Cardiff (1986) reported recent changes in medical

curriculum, implemented so that students were placed in lifelike situations requiring them to practice the content they were learning. The traditional lecture approach, isolated from other departments, is giving way to lecture, laboratory, and discussion periods, and library research is being folded into coursework rather than assigned separately.

Dronka (1988) and Miguel (1985) reported that some students learn better through direct application of concepts than through the more traditional abstract approach. Students prefer clearly written, well organized materials with a practical emphasis (Dorsten & Smink, 1988). The Southern Regional Educational Board (SREB) of Atlanta, Georgia (Bottoms & Korcheck, 1989), suggested that vocational education coursework should be linked to academic content, and that academic content should be linked to practical vocational applications. Vocational teaching is typically able to make more explicit to students the academic foundations of their courses and, as academic teachers use more vocational examples, students' understanding of basic skills and academic content increases (Owens & McClure, 1989).

Pucel et al. (1988) suggested that integrated lessons should include practice, demonstrations, instruction on understanding procedures, feedback, evaluation, and instruction on related theory. Learning theory suggests that students learn more rapidly and retain more of what they learn when job related materials and tasks are used in instruction. It becomes necessary for teachers to observe tasks as they are performed in the workplace, to gather materials, and to develop instruction which will simulate key work elements (Drew, Mikulecky & Pershing, 1988).

Models of Integration

Many models may be followed in developing integrated approaches to the delivery of vocational and academic curriculum and instruction. Successful practices have been grouped into five categories that occur: within a single class, between two classes, across a school, beyond a school, and at the state level (Owens & McClure, 1989). In the planning stages, decisions must be made related to the structure or form of integration. Teachers can then begin to make decisions regarding instructional delivery. These delivery systems may include sharing, which refers to sharing concerns, strategies, and resource materials; teaming, which refers to sharing actual teaching responsibilities; or staff crossover, where teachers actually exchange roles with each other (Naylor, 1988; Rous & Williams, 1987).

In an integrated setting, when the delivery of academic content is to be taught by an academic teacher, a major requirement for success is making sure that the academic teacher correlates what he or she is teaching with what the vocational teacher wants done. Each academic teacher should meet regularly

with the vocational teacher (Rose, 1988). Often this can be difficult to accomplish due to problems related to scheduling, location of instructors, and misalignments in the timing of similar curricular content.

An integration effort may encompass an entire school rather than just a department or a pair of teachers. The Pennsylvania Dauphin County Technical School (Rous & Williams, 1987) incorporated vocationally oriented, competency based instruction into all academic areas. They eliminated the traditional department organization and created vocational clusters. One teacher from each academic area joined each cluster. Instruction alternated between academic and vocational content.

Another popular integration method involves the use of applied academic courses. Bottoms (1989) recommends replacing general math and science courses with applied courses at the beginning of high school, and encouraging students to take more advanced courses in these disciplines. He found that vocational students who took these kinds of courses did as well on the National Assessment of Educational Progress (NAEP) science test as did students who had completed the regular academic physics course. Additional research has examined how to divide instruction among differing kinds of applied academic content. Drew, Mikulecky, & Pershing (1988) suggest a model of: (a) 10-20% of classroom time spent on direct personal instruction, (b) 20-30% spent on simulation practice, (c) 20-30% on general job-reading practice, and (d) 20-30% spent on related commercial materials practice.

The Agency for Instructional Technology (AIT) and the Center for Occupational Research and Development (CORD) were two of the first to design integrated academic and vocational-technical curricula. They developed the "Principles of Technology," "Applied Mathematics," and "Applied Communications" programs (Losh, Border, & Bishop, 1988). Programs like these are being developed on state and local levels and infused into schools. The "Principles of Technology" applied-physics course is the most widespread. It covers force, work, rate, resistance, energy, power, force transformers, momentum, waves and vibrations, energy converters, transducers, and optical systems (Owens & McClure, 1989).

Bottoms (1989) has reported that achievement levels of vocational completers have significantly improved after the completion of one or more "Applied Mathematics" courses. "Applied Mathematics" covers arithmetic operations, problem solving techniques, estimation of answers, measurement skills, geometry data handling, simple statistics, and algebraic formulas. "Applied Communications" covers verbal and written communication skills needed for work (Owens & McClure, 1989).

Focus Question Five: Summary

Integrating academic and vocational disciplines will require educators to develop the relationships between their respective programs (Dronka, 1988; Rose, 1988; Wade & Williams, 1988). Thoughtful and deliberate analysis of taxonomies of learning will be required to relate academic knowledge to vocational content (Vocational Education, 1988). Vocational educators will be expected to assist academic faculty by helping to pose theoretical content in terms of working world realities (Miguel, 1985). Teachers will need to form partnerships based on a mutual commitment to providing the best curriculum for all students (Wade & Williams, 1988). This process will demand the support of local administrators, who may well be the key at both decision and institutionalization stages (Dorsten & Smink, 1988).

Liberal arts and vocational education can be integrated in many ways. Curricular integration, personnel integration, facility integration, or a combination of these can be used to provide opportunities for vocational and liberal arts or academic teachers to work together to assist students in the acquisition of basic skills.

Focus Question Six

"To what extent does integrating liberal arts and vocational education enhance the acquisition of basic skills?" The information presented here reviews the small empirical database examining efforts to integrate teaching of vocational and academic content.

Successful Integration: Examples

Almost 3,100 high school seniors identified as vocational completers from 34 pilot sites were studied by the Southern Regional Educational Board (SREB) (Bottoms & Korcheck, 1989). The SREB schools in the 13 member states implemented approaches designed to increase reading, mathematics, and science achievement. Approaches included requiring students to complete a more rigorous and coherent program of vocational and academic study; increasing the amount of time vocational teachers spent explicitly reinforcing higher-level basic competencies; expanding the use of applied, "real world" instructional approaches in academic courses; designing courses that focused on developing specific academic skills; and providing individualized counseling to assist students in the selection of courses.

The following are highlights from the SREB research. Unless otherwise indicated, national comparisons are made to 17-year-old public high

school students based upon the most recent National Assessment of Educational Progress (NAEP) data, a national sample of students taken in the Spring of 1986.

1. Reading and mathematics achievement for SREB site vocational completers was significantly above the national average for students nationwide who indicated they were vocational students; science achievement was at the national average.
2. Compared to students from public and private high schools nationwide who indicated they were in the general curriculum, SREB site vocational completers scored significantly above the national average in mathematics, at the national average in reading, and significantly below the national average in science.
3. Compared to all black students in the nation, the reading and mathematics achievement of black vocational completers at the SREB sites was significantly above the national average; science achievement was at the national average for all black students. In each of the three subject areas assessed, the scores of white vocational completers at the SREB sites were significantly below the scores of all white students in the nation.
4. Consistent with the NAEP national data, white vocational completers at the SREB sites scored significantly higher in all three subject areas than did black students; however, the gaps between the scores of black and white vocational completers at the SREB pilot sites are about half that of the gap between scores of all black students and all white students in the nation.
5. The average achievement of female SREB site vocational completers was significantly above that of male SREB site vocational completers in each of the subject areas assessed.
6. SREB site vocational completers who indicated that their vocational teachers stressed the importance of reading and mathematics skills (46% and 56%, respectively) demonstrated significantly higher achievement in reading and mathematics than completers who indicated that their vocational teachers never stressed the importance of these skills.
7. Fewer than half of the SREB site vocational completers chose their mathematics and science courses from the college preparatory curriculum — 44% and 35% reported completing geometry and algebra II, respectively; 27% and 11% indicated they had taken chemistry and physics, respectively.
8. The average mathematics achievement scores of SREB site vocational completers consistently increased as they reported having taken progressively higher levels of mathematics courses, from general mathematics through calculus.

9. Responding to questions about their high school experience, 26% of the SREB site vocational completers reported that they were not assigned homework each day, 55% said they were not encouraged to take more mathematics and science courses, and 13% indicated that most teachers did not expect them to do well in school.
10. Asked what one thing they would do differently if they could repeat high school, 45% of the SREB site vocational completers indicated they would study more, and 35% reported they would choose high level mathematics and science courses to complement their vocational studies and better prepare them for college.
11. When asked to indicate what they planned to do after high school, 47% of the SREB site vocational completers reported that they would pursue further education (28% of those would take academic coursework at a two or four year college), 38% said they planned to work full time, and 8% planned to enter the military (pp. 6-24; Appendix B, Table 13).

Two studies reported the successful combination of academic and vocational programs in the California Peninsula Academies (Stern, Dayton, Paik, Weisberg, & Evans, 1988; Stern, Dayton, Paik, Weisberg, 1989). These studies evaluated 11 academies created in California public high schools to retain likely dropouts. The state of California is subsidizing these academies, which are designed to replicate two programs begun in 1981 in a school district on the San Francisco peninsula — hence the name Peninsula Academy. Each academy is a school within a school. All of the academies at present are designed to enroll students from grades 10 through 12. Each academy focuses on a particular occupational sector, such as the health industry or computer related occupations. Both studies offer strong evidence that the academy model is successful in reducing the number of dropouts. In general, students in the academy programs had better attendance rates, took more credits in school, attained a higher GPA, and failed fewer courses than the massed comparison group (Stern et al., 1989).

Assani (1989) developed an innovative integration model and reported nine essential factors for integrating woodworking and science: (a) availability of common elements in the subjects in question; (b) availability of teachers capable of teaching both subjects at an "ordinary" level; (c) flexibility in content organization and sequencing of the subject taught; (d) availability of time for teachers, enabling them to arrange for team teaching; (e) ability of teachers to work with other teachers effectively when team teaching; (f) commitment of teachers to integration; (g) ability of teachers to identify interrelated elements; (h) availability of ready made material for integration; and (i) teachers' knowledge of subjects related to their own.

Successful Integration: Elements

Adelman (1989) identified, described, and assessed the potential of innovative approaches to integrating vocational and academic education. This study had the following eight major findings:

1. Curriculum development and professional development are the key activities associated with implementing an integrated vocational/academic curriculum.
2. It is preferable to have both academic and vocational instructors involved in the integration process from the start.
3. Some funding is needed to support professional and curriculum development activities.
4. Often, significant social, intellectual, and even physical barriers between the vocational and academic staff in a high school must be breached to make curriculum integration work. Here, in particular, strong leadership is needed.
5. Restructuring the relationship between academic and vocational education takes a long time — five years is probably a realistic minimum time frame.
6. In most cases, evaluation is a weak component in program design and implementation. It is difficult to measure the impact of an applied approach to academics on student achievement. Anecdotal evidence shows that applied curricula seem to stimulate students to become more engaged in classroom academic tasks.
7. Some danger exists in expanding curriculum integration efforts that focus on "high tech" vocational programs to the exclusion of more traditional vocational education: Many of the students most disaffected with their academic work are enrolled in traditional vocational programs.
8. Mainstream educational and cognitive research has not addressed the potential value of teaching academics in a vocational setting.

Implications from Adelman's (1989) study focus on five areas:

1. The Need for Research. The need for the integration of academics and vocational education should not become strictly a vocational movement. Careful, controlled studies are needed to assess the value of applied academics.
2. The New Role of Vocational Education. One of the most positive outcomes of integrating academic and vocational curricula is a new respect for the vocational component as part of the solution and not part of the problem. This appears to

signal both a new assertiveness and a retreat from defensiveness on the part of at least some vocational educators.

3. Time. In taking steps to encourage new relationships between academic and vocational education, policymakers should not underestimate the amount of time required to restructure firmly entrenched attitudes and behaviors. Standard three year funding cycles, for example, may not carry such an innovation through planning and early implementation.
4. Evaluation and Assessment. Schools and school districts willing to experiment with the integration of academic and vocational education need expert assistance in identifying and developing appropriate instruments for student assessment and program evaluation.
5. State Support. States can mandate curricular change (as in the case of New York), provide effective funding incentives for innovation (as in California), or endorse programmatic changes (as in Ohio). At the very least, given the documented low achievement levels of the average American youth, states should not penalize schools and school districts for experimenting with new approaches to curriculum and instruction.

Balancing Integrated Curricula

A study by Kang and Bishop (1988) focused on an appropriate balance between academic and vocational education. They calculated how the number of academic and vocational courses taken correlated to wage rate, number of months employed over a two year period, and earnings over an 18 month period. The regression analysis produced a curvalinear model. As students take a few vocational courses, labor market success jumps drastically. After four vocational courses, however, labor market success drops sharply. The simple linear model estimated that substituting four extra vocational courses for four academic courses increased a male's wage rate by 7.1%, months employed by 8.2%, and earnings by 16.6%. For females, the increases were 5.4% for wage rates, 22% for months worked, and 36% for earnings.

The study indicates that students who choose to take some modest level of vocational coursework benefit greatly relative to those who specialize totally in academic courses, but once three or four vocational courses are taken the benefits of those additional courses sharply diminish. The clear policy implication of this result is that: (a) every student who does not have definite plans to attend college full time should be urged to take three or four courses in an occupational specialty, and (b) vocational students should be counseled against taking an excessive number of vocational courses at the possible expense of academic courses.

Focus Question Six: Summary

Only limited data exist concerning integration's effects on basic skills acquisition. However, studies completed to date indicate that integration, implemented with an emphasis on balancing each student's program between academic and vocational curricula, has a powerful and measurable impact on basic skills acquisition.

CHAPTER FOUR

Summary and Recommendations

Skills held by youth entering the American workforce appear to be different from the skills they most need. Report after report has expressed concern that the old basic skills — the ability to read, write, and compute — even if developed to once satisfactory levels, are not sufficient to start workers off well in the workplace of the 1990s. The more contemporary set of basic skills includes the attitudes, knowledge, and behaviors needed to function in an increasingly self directed, interpersonal, and technological workplace. These skills include: learning to learn; reading, writing, and computing; verbal and nonverbal communication; adaptability (including creative thinking and problem solving); personal management (including self-esteem, goal setting/motivation, and personal/career development); group effectiveness (including personal skills, negotiation, and teamwork); influence (including organizational effectiveness and leadership); ability to use and understand technology; ability to apply the knowledge of science to work situations; and the ability to balance and manage family and work.

Schools are being presented with the challenge to integrate these new basic skills into instruction across their curricula. Vocational educators have historically been first to respond to the changing skill needs of the workplace. But all students work, not just vocational students. Thus, the call for planning and integration of basic skills into vocational education is a part of a larger demand. Learning theory suggests that training in these new basic skills must be included in all aspects of the public school curriculum to assure that students get these skills and get them well. This effort to integrate instruction in both theoretical and applied knowledge targets directly Maccia's (1965) four domains of knowledge — descriptive, prescriptive, formal, and praxeological. Delivering integrated instruction effectively will require nothing less than a significant reshaping of how our schools and curricula are organized and how our administrative and teaching personnel think and teach. Vocational educators must begin to take a leadership role in this movement to restructure schools.

The first challenge facing vocational educators as they attempt to assume a co-equal role in developing integrated curriculum is to convince teachers, administrators, and parents that training in the ability to apply knowledge is as important for students as knowledge itself. The second challenge is to convince teachers, administrators, and parents that all students learn better when they are required to use their new knowledge in community, family, and workplace settings. Vocational educators represent a bridge to these relevant settings.

Historical differences in the way vocational and academic instruction have evolved in our public schools has led to a hierarchical structure between the two, with vocational education consistently filling the inferior role. It is as if the school system is designed for two types of students — those who will work with their minds and those who will work with their hands. As specialization of knowledge increases due to the information explosion, however, all individuals will need to think and work with greater integrative complexity, with both their hands and their minds. To deliver this training well and efficiently, curriculum and instruction must be integrated, combining vocational and academic knowledge bases and presenting students with the opportunity to develop skills necessary for occupational, personal, and educational success.

Organizing our schools, curricula, and personnel to deliver integrated instruction will require action across a variety of dimensions. A logical place to begin to sustain change over the long term is in our teacher education programs. Teacher educators have significant opportunities to instill in future teachers the commitment to demand integrated teaching assignments. It is not likely that teacher educators will be successful, however, if they continue to deliver their training by segregating vocational and academic teacher education. They must model integrated teaching of both theoretical and applied knowledge, and demonstrate cooperation with others, negotiation of differences among faculty members, and flexibility in the educational environment. Thus, integration of content and instruction is indispensable. It requires a serious look at curricula, instruction, and organizational structure to identify the content and processes essential to successful teaching in an information society. It also requires teacher educators to help preservice teachers avoid dualistic thinking. The skills of thinking laterally and creatively require practice. Teacher educators must help their students learn these skills.

Emphasis on both formative and summative evaluation of students' skill acquisition is imperative in the preparation of future teachers. Much like industry's emphasis on Statistical Process Control (SPC) or management's recent focus on Total Quality Management (TQM), teachers must be taught ways to evaluate youth at every step of an educational program. An Educational Quality Control (EQC) system is needed.

This EQC system also needs to measure skill acquisition from a frame of reference that acknowledges more than traditional forms of intelligence. This literature review supports the idea of a spectrum of human intelligences, as hypothesized by Gardner (1983; 1987). In addition to the traditional forms of intelligence associated with logical-mathematical reasoning and linguistic skills, the other facets of the spectrum are intelligences associated with spatial perception, bodily-kinesthetic control, and interpersonal and intrapersonal abilities (Gardner, 1989). A critical examination of these alternative forms of human intelligence suggests a great deal of congruence with the types of skills and abilities needed in the workplace of the twenty-first century. Clearly, both

teacher educators and their students must learn to value and assess multiple forms of human intelligence. Curricula and teaching styles often ignore how the brain functions. In fact, often, curriculum and teaching-learning interactions are designed in direct contradiction to brain function research (Caine & Caine, 1991). Vocational education has the opportunity to be a leader in incorporating results of this research into curricula.

While the responsibility for the delivery of preservice education lies with teacher educators, curriculum developers also have a responsibility in the success of integration efforts. Materials provided to teacher educators must, themselves, model integration. Curriculum materials should be flexible enough to be used with both preservice and in-service teachers. The materials must be user friendly and individualized, they must focus on competency based outcomes, and they must emphasize multiple processes which lead to multiple solutions.

Finally, attention must be given to the competencies necessary for all preservice teachers as they exit the system. These teachers should be able to: (a) understand different learning styles and how teaching in either an abstract or applied method will affect learning; (b) understand how to help students expand their possibilities beyond what their experience may have limited them to consider; (c) assess students' strengths and weaknesses in such a manner that students are accelerated in learning rather than remediated; and (d) demonstrate competency in the contemporary basic skills.

This literature review suggests the need for an active research and demonstration agenda. We need to know how to assess the acquisition of contemporary basic skills. We need to validate the fact that employers look for these skills in workers and make hiring, retention, and promotion decisions based on them. And we need to know if there are thresholds of knowledge in these basic skills above which the return for students is marginal when measured against the investment in training.

Research is also needed on the use of integrated teaching, both at the preservice and public school levels. This research must span the domains of organizational restructuring, curriculum integration, and team teaching with a variety of personnel. We need to test the effects of different integrated teaching techniques in a host of school structures, large and small, urban and rural, heterogeneous and homogeneous, public and private. Problem based teaching is a promising instructional approach to integrated teaching, yet it has a surprisingly narrow empirical base with equivocal results. It needs to be examined through a variety of methodological approaches and across the spectrum of educational levels and content areas. Finally, we need to know what teachers and administrators think about integrated teaching when they do it. How long does it take to implement integrated teaching, and how does this length of time vary for different models of integration? What is its impact on school climate and organizational complexity? How viable is an Educational Quality Control system to monitor the delivery of integrated teaching?

Contemporary basic skills identified in this review appear to be what will be necessary for students to know if they are to function successfully in the workplace, the community, and their families. To acquire these skills, students must be taught theoretical knowledge and then given opportunities to demonstrate that knowledge. The world is changing so rapidly that the varieties of work awaiting the next generation are unknown. But change is not random; it has recognizable patterns. The literature illustrates a pattern of change in the workplace, a new demand for workers who are both (a) autonomous in the implementation of their knowledge and (b) dependent on coworker team members to move the organization forward. Workers now need to be flexible, and possess skills in personal management, communication, reading, writing, computation, adaptability, and group effectiveness. The education community must assume responsibility for providing practice in these skills during students' vocational and academic training. Incorporating this practice into education will require a paradigm shift for schools, but the benefits to students will be worth the effort.

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